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TECHNOLOGICAL CHANGE AND SOCIAL ADJUSTMENT

(Commission Communication to the Council)

Com 6

TECHNOLOGICAL CHANGE AND

SOCIAL ADJUSTMENT

COMMISSION COMMUNICATION TO THE COUNCIL

SUMMARY

The purpose of this Communication is to propose a Community strategy for new technologies which, complementing those already launched in the sphere of industry, research, development and innovation, will bring a positive response to the social challenges.

After reviewing briefly the social implications of technological change and the need for joint action, it sets out a certain number of proposals on the development of existing activities and new measures.

These proposals come under three priority headings:

I. Education and training

The Council Resolutions of June 1983 concerning the introduction of new information technologies into education and vocational training for new information technologies already provide a basis for Community action. However, the most determined efforts in the fields of research, development and industrial policy will be hampered and might even fail unless they are matched by similar efforts in initial and continuing training for high level specialists and technicians. The Commission envisages new measures to set up and help finance "partnership programmes" between industry and higher education, training and research establishments tailored to local or regional needs, in order to expand high level training and help it to adapt to the changing needs of industry.

In order to supplement current actions in the educational field whilst establishing a link with the partnership programmes the Commission proposes the launching of demonstration operations at Community level to increase awareness of and familiarity with the new technologies, whether in schools or among the general public.

II. Management of working time and organisation of working and living conditions

In the context of technological innovation the reduction and reorganisation of working time and the promotion of forward looking manpower policies, especially at local level, take on particular importance.

The Commission intends to give priority to the development of knowledge concerning the impact of new technologies at enterprise and sectoral level on employment, working time, remuneration and other elements of working and living conditions.

It also proposes concerted action aimed at improving the ergonomic aspects of equipment and its methods of use as well as the development of Community standards for health and safety.

III. Participation in technological change in the firm

Following through the conclusions of the Standing Committee on Employment of November 1981, the Commission intends to carry out further research and to promote the formulation by the social partners at European level of common principles which should enable agreements to be concluded between them on procedures for the implementation of new technologies consequent upon their introduction in the firm. It also intends to support initiatives to enhance the expertise of the social partners in matters of technological innovation.

The actions in these three fields should be reinforced by the promotion and dissemination of innovatory projects and by more systematic use of existing funds and financial instruments, of which the aspects most relevant to reconversion and technological innovation are described.

The innovatory projects should relate in particular to the development of local employment initiatives involving new technologies and new goods and services based on these technologies which meet social needs, for example those concerning handicapped or elderly people.

The points of reflection on which the Commission drew and which form a contribution to the debate which it considers essential to develop at a European level are given in the annex.

TECHNOLOGICAL CHANGE AND SOCIAL ADJUSTMENT

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A. PROPOSALS FOR ACTION

I. OBJECTIVES

1. The European Community must lay the foundations for new economic growth by using the potential offered by innovation. In a free trade economy, the survival of European industry and the essential strengthening of its competitiveness depend on the ability to adjust to new forms of demand and new technologies, especially in the field of information.
2. Economic recovery, however, does not depend solely on our capacity to develop new products and services or, more generally, to free a growth potential whether in terms of gains in productivity or new markets. It also calls for the optimization of the social consequences of technological change. It means that a positive response must be found to the social challenges: first unemployment and also aspirations for a better distribution of activities in time (problem of work organisation), in space (regional disparities) and between individuals (access to employment).
3. The purpose of this Communication is to propose a Community strategy, complementary to those already launched in the fields of industry, R. & D. and innovation which will be capable of meeting these challenges. The Communication considers the social implications of technological change and the need for common action; it then presents certain proposals on the development of existing activities and new measures. The Commission intends the Community to play its part to the full in fostering the emergence of a social consensus on new technology and contributing to greater innovation and industrial competitiveness. In so doing, the Commission shares the concern expressed, in particular, by the European Parliament and the two sides of industry.

II SOCIAL IMPLICATIONS OF TECHNOLOGICAL CHANGE

4. With the many studies and research work in the field, this is far from being a new subject. Without repeating the analysis which is given in the Annex to this Communication, it is clear that new technology modifies and could even revolutionise the characteristics of employment and living conditions. The nature and extent of such changes depends largely on the decisions that must now be taken in the light of the following factors:

- (i) the effects of technological innovation on the volume and structure of employment depend primarily on the actual nature of the innovation: new processes, by reducing production costs and making the product more competitive, are usually the essential prerequisite to the maintaining if not the redeployment of economic activity. However, in many cases they lead to job losses, especially when there is economic stagnation. On the other hand, innovatory products and services create new markets and, usually, new jobs;
- (ii) the accelerating spread of new technologies results in a realignment of employment sectors which in turn produces intersectoral transfers of workers, of whom certain categories are more affected than others;
- (iii) the introduction of new technologies accentuates changes in the structure of jobs: a drop in industrial employment, relative increase in employment in the service sector and, more generally, greater "tertiarisation" of production

functions (increase in design, control, maintenance and management tasks). Already some 65 to 70% of active Europeans are in the tertiary sector;

- (iv) by changing the content of work in an increasing number of areas, new technologies create new demands for skills and thus for training, especially in the new development fields; one of the obstacles to the full development of new technology is still, in spite of the efforts made, the considerable quantitative and qualitative shortcomings of education and training in the new technologies;
- (v) new technologies, especially information technology, can facilitate the decentralisation of occupational activities, although the regions where employment needs the most stimulation are those which have, until now, attracted the least investment in job-creating technology. Furthermore, these technologies encourage the externalisation of certain activities (eg, sub-contracting) which favour the growth of small or medium-sized enterprises, although the resulting jobs are often precarious;
- (vi) the introduction of new technology in a firm changes the data relating to the distribution, duration and organisation of working time. It can create more leisure time which could have a beneficial effect on the demand for goods and services in the leisure sector. The first

to benefit would be the electronics industry and tourism which has particularly high manpower requirements;

(vii) new technology can, with the help of good ergonomic design and a reorganisation of tasks, help to improve working conditions, eg, by increasing the flexibility of working hours;

(viii) the introduction of new technologies into undertakings increases the need for a dialogue between the parties concerned; one of the obstacles being that the solutions which produce a consensus within the firm can mean an increase in costs in the short term.

5. These data and the considerations developed in the Annex are the reasons why the Commission considers that priority should be given to a series of measures on the social effects of technological change, which would form an interface between industrial, R & D and innovation policies and social policies.

III. THE NEED FOR COMMON ACTION

6. To assign the same responsibilities to the Community as to the Member States would be not only to forget the limits of its jurisdiction and its means, but also to create pointless duplication of work. Even though the Community's contribution to the field in question is only partial, it is nevertheless essential. It has already taken certain steps in the field of technological development and social policy, especially as regards employment, labour, training, education, industrial innovation and research. The table on page 5 gives a necessarily brief picture of the main current activities in these fields.

7. The development of activities already underway and of new measures is necessary, as it is becoming increasingly difficult to obtain the technological conditions and the conditions as to market size, etc. that are essential if innovatory technological and industrial development is to meet challenges at world level; it is even more difficult to meet all these conditions at the national level. Similarly, with the Member States facing growing economic difficulties, the contribution which the Community can make is even more decisive: Community action can prevent economic and social fragmentation from increasing within the Community; it can also reduce our handicaps in world competition.

PRINCIPAL COMMUNITY MEASURES AND INITIATIVES CONCERNING
TECHNOLOGICAL CHANGE AND SOCIAL ADJUSTMENT

(see following page)

TECHNOLOGICAL AND INDUSTRIAL DEVELOPMENT

Stimulation of the Community's scientific and technical potential, COM(82)808 final

Framework programme 1984-1987, COM(83)260 final
ESPRIT, COM(83)258 final

Biotechnology, COM(83)672 final

Telecommunications, COM(83)573 final

Multiannual programme of R&D: basic and applied technologies, COM(83)350 final

Multiannual dataprocessing programme, COM(82)356 and COM(83)658

Community strategy for European industrial development, COM(81)639 final

INNOVATION AND TECHNOLOGICAL TRANSFER

Industrial development and innovation, COM(80)755 final

A policy for industrial innovation: strategic lines of a Community approach, COM(81)620 final

Use of the results of Community financed R&D, COM(83)18 final

Plan for transnational development of the infrastructure for assistance to innovation, COM(83)277 final

Proposal for a Decision on the financing of innovation, COM(83)241 final

EMPLOYMENT, LABOUR AND TRAINING POLICIES

New information technologies and social change, COM(81)578 final

Vocational training in the European Community for the 1980s, OJ C193, 11.7.83

Vocational training and new information technologies, OJ C166, 25.6.83

New information technologies and education, OJ C256, 24.9.83

Action programme to promote equal opportunities for women, COM(81)758 final

Youth employment, COM(83)211 final

Draft Recommendation on the reduction and reorganisation of working time, COM(83)543 final

Local employment initiatives, COM(83)662 final

Decision on the role of the Social Fund, OJ L289, 22.10.83

Guidelines for the management of the Social Fund, 1984-86, OJ

MAIN COMMUNITY ACTIONS AND INITIATIVES
ON TECHNOLOGICAL CHANGE AND SOCIAL ADJUSTMENT

8. It is no longer necessary to demonstrate the importance of education, training and retraining systems as a factor of the success of social change. Suffice it to repeat that Europe needs high-level scientific and technical skills. Three prerequisites must be considered:

- (i) adaptation of the content of education and initial and continuous training to the new demands of scientific progress;
- (ii) removal of the barriers between initial training and adult training;
- (iii) post-secondary training should be regarded as one stage in a process of training, retraining and further training lasting a whole lifetime.

9. The management of working time and the organisation of living and working conditions impinge on the process of economic adjustment in several ways;

- (i) the reorganisation and reduction of working time, ie, its management in the broadest sense, can assist the introduction of new technology and, provided it does not detract from the competitiveness of firms, can help to maintain employment levels;
- (ii) new technologies can fulfil personal aspirations for more flexibility in working time;
- (iii) the successful introduction of new technology and the general economic and social success of technological change depend on substantial

improvements in working conditions brought about by new technology and the reduction in risks and constraints due to certain uses of these technologies;

- (iv) new technologies can have a positive impact on living conditions, for example by increasing leisure time, improving the utilisation of public services and facilities and helping the social integration of handicapped people.

10. As regards participation in technological changes, experience has shown that the competitiveness of European industry often depends on the adaptation of industrial relations. Where the staff concerned have been consulted and their knowhow and commitment used, technological innovation and the protection of employment has taken place efficiently, without jeopardising the decision-making powers of the entrepreneurs regarding the introduction of new technologies.

11. A Community effort along these lines can contribute both to the development of social policies and to that of industrial, R & D and innovation policies, as shown in the table below:

	<u>INDUSTRIAL, R&D, INNOVATION POLICY</u>	<u>SOCIAL POLICY</u>
Education & Training	<ul style="list-style-type: none">- higher productivity- development capacity of leading sectors	<ul style="list-style-type: none">- flexibility of labour market- personal fulfilment- more privileged social life
Management of working time	<ul style="list-style-type: none">- greater flexibility of production system	<ul style="list-style-type: none">- response to quality of life aspirations- distribution of employment
Participation in technological changes	<ul style="list-style-type: none">- greater mastery of production system.	<ul style="list-style-type: none">- change in attitudes- clearer definition of needs

IV. NEW DEVELOPMENTS, NEW MEASURES

12. The Commission intends to develop action already started as a follow-up to the conclusions of the Standing Committee on Employment of November 1981 and to present new measures, the following three fields having priority:

- education and training
- management of working time and the organisation of working conditions
- participation in technological change in the firm.

The Commission considers that, to be fully effective, such action should be backed up by:

- measures to promote and disseminate innovatory projects in these fields
- more use of existing funds and financial instruments (ESF, ERDF, NCI, EIB, etc.).

IV. 1. FIRST FIELD OF ACTION: EDUCATION AND TRAINING

13. The Resolution adopted in June 1983 by the Council and the Ministers for Education meeting within the Council on measures relating to the introduction of new information technology in education ⁽¹⁾ provides the framework allowing the Community to supplement action by Member States. On this basis, the Commission can now initiate or support Community level initiatives to introduce new information technology into education, teacher training, the development of software and hardware systems, the exchange of experimental data. Member States should rapidly implement the proposals for action resulting from the Resolution and communicated to the Committee on Education (2).

(1) OJ no C256, 24.9.1983

(2) OJ

14. The Council Resolution concerning vocational training measures relating to new information technologies (1) is another element of the Community action, as the major points concern:

- the implementation of demonstration projects;
- a review of the format and content of certain training sectors with a view to better matching of qualifications. The Council should adopt without delay the draft Decision under examination (2).

These activities form part of the more general framework provided by the Council Resolution on vocational training policy in the European Community in the 1980s (3).

15. In view of the lack of inter-disciplinary qualifications in the new developing fields, the Commission envisages new measures to improve and increase training and retraining for skilled technicians and specialists. The intention is, in prolongation of the activities to stimulate the scientific and technical potential of the Community (4), to promote and set up "partnership programmes" between industry and higher education, training and research institutions, in order to expand high level training and help it to adapt to the changing needs of industry. The Community would participate in the financing. The programmes would cater to local or regional needs and would be started simultaneously in several Member States. Emphasis would be on participation by innovative small and medium-sized firms, thus laying the foundations, in terms of manpower, for technology-oriented local and regional development. The technical content of the programme should be based on that used in Community-level

(1) OJ no. C 166, 25.6.1983
(2)

(3) OJ no. C 193, 11.7.1983
(4) COM(82)808 final

research and development programmes. These actions will thus help participants to play a more active role in the Community programmes. Such action would also mean increasing the Commission's means of observation and analysis to enable it to assess the nature of new demands for highly qualified personnel in the fields of technological development on a permanent basis.

16. In order to supplement current actions in the educational field whilst establishing a link with the "partnership programmes", the Commission suggests that demonstration operations be introduced at Community level to increase awareness and familiarity with the new technologies, either in schools, or among the general public. The operations will in particular concern the introduction of micro-computers into education and the development of special training in information technology.

IV. 2. SECOND FIELD OF ACTION: MANAGEMENT OF WORKING TIME AND THE ORGANISATION OF WORKING AND LIVING CONDITIONS

17. The principles concerning the reduction and reorganisation of working time formulated in the draft Commission Recommendation (1) are particularly important in the context of the introduction of new technologies, in view of the impact of the latter on the level and structure of employment, and on the conditions and the organisation of work inside each enterprise. Just as agreements on working time should take account of the introduction of new technologies, those concerning the introduction and use of these technologies should provide for the exploiting of the possibilities provided by the reduction and reorganisation of working time. In this connection, the Commission intends to give priority to the development of knowledge on the impact of new technologies on the labour market and their social

(1) COM(83)543 final

effects at sectoral and enterprise level and on the use of leisure time.

18. The actions to be developed would be as follows:

- (i) to pursue, together with the social partners, the search at Community level for approaches involving the use of new technologies to improve employment conditions, taking account of workers' interests and firms' competitive requirements;
- (ii) to promote forward-looking labour market policies with the active participation of all the parties concerned at local and regional levels;
- (iii) to increase at the level of the Commission the means of identifying and observing the short and medium-term impact of technological change on employment, working time, remuneration and other features of working and living conditions, taking account of sectoral trends;
- (iv) to implement at Community level, as an extension of the multiannual data-processing programme (1), joint action to improve working conditions, especially as regards the physical working environment, the ergonomic aspects of equipment and its methods of use;
- (v) to complement the action programme on health and safety at the work place by drawing up further Community standards;

(1) COM(83) 658 final

- (vi) to encourage the parties concerned to foster better social integration and living conditions for handicapped persons by together defining suitable equipment which makes use of new technology (1).

IV.3. THIRD FIELD OF ACTION: PARTICIPATION IN TECHNOLOGICAL CHANGE

- 19. In order to extract the maximum benefits from the introduction of new technologies as regards the competitiveness of enterprises and their impact on employment, qualifications and working conditions, workers and their representatives should be involved in the decisions concerning them, consequent upon the introduction of such technology.
- 20. A partial answer to this problem has already been given in the Directives on informing and consulting employees in the event of collective dismissals (2) or transfer of undertakings (3). Other proposals for directives (4) already forwarded to the Council are aimed at protecting workers in more general cases concerning decisions involving "major organisational changes", or "the introduction of new working methods".
- 21. In this context, and further to the conclusions of the Standing Committee on Employment of November 1981, the Commission intends to:
 - (i) step up research and the dissemination of information on experiments and practices in forms of worker participation linked to the introduction of new technologies in firms;

(1) OJ no. C347, 31.12.81

(2) Directive 75/129/EEC, 17.2.1975

(3) Directive 77/187/EEC, 14.2.1977

(4) OJ no. C 240, 9.9.1983 and

- (ii) promote at European level the formulation by the social partners of common principles which should - taking account of existing instruments, both legal and collectively agreed, in Member States - enable agreements to be concluded between them on procedures for the implementation of new technologies consequent upon their introduction in the firm;
- (iii) support initiatives to enhance the expertise of both sides of industry in matters of technological innovation.

IV.4. SUPPORTING ACTIONS

22. In order to provide support for its action in the fields described above, the Community should implement measures to promote and disseminate experimental projects and improve the use made of Community financial instruments.

(i) promotion and dissemination of experimental projects

23. The most frequent reason for new technologies being resisted or even rejected is a negative opinion of their social effects, especially when the volume of alternative jobs is inadequate. In order to help to remedy this, Community actions should make it possible to support and disseminate at European level the results of innovatory, local projects involving, for example:

- the creation of enterprises and, more generally, the development of initiatives to create jobs involving new technologies;
- new products and services based on new technologies, which fulfil social needs, especially those of handicapped and elderly people;

- "village-technology-jobs" programmes likely to boost employment in rural areas,
- access for handicapped people to high-technology jobs.

(ii) better use of Community financial instruments

24. The European Social Fund can play a major part in technological and social change by supporting training activities. The guidelines for the management of the Social Fund in the financial years 1984-1986 adopted by the Commission on 21st December 1983 are formulated so as to help the labour force adjust to changes in the labour market resulting from technological developments. They define the Fund's intervention priorities, in particular as regards:

- operations to develop employment which accompany reconversion or restructuring;
- vocational training operations for persons employed in SMUs who require retraining as a result of the introduction of new technologies;
- vocational training operations for instructors in the new technologies.

25. The Commission asks Member States, on the basis of the Guidelines, to submit applications for aid:

- aimed at a first-time application in a Member State of a new technology likely to benefit the sector as a whole;
- for training actions involving innovatory skills, as part of operations leading to the creation of new jobs in expanding sectors, where the labour shortage is such that the

introduction of new technologies or production techniques is liable to be hampered.

26. As part of its aid to innovatory operations, the Fund can also provide support for training projects designed, in particular in the field of new information technologies, to encourage the development of promising approaches (1) and to transfer knowledge capable of enriching the policies and practices of Member States, for example in the following areas:

- the requirements of enterprises with regard to training in new technologies, especially the requirements of small and medium-sized enterprises including cooperatives and the staff of other enterprises particularly affected by the application of these technologies;
- helping unemployed young people, in particular those with inadequate or unsuitable qualifications, to enter working life through suitable measures of training in new technologies;
- helping skilled workers, whether or not unemployed, and particularly older workers whose employment has been or is likely to be affected by industrial restructuring, to remain in employment or to find new employment by furthering their occupational mobility;
- the retraining or re-entry into employment of women whose employment is threatened by the introduction of new technologies or who want to take up work again;
- the training of instructors in the application of new technologies in cooperation with the business world

(1) OJ no. C 166, 25.6.1983

27. When the review proposed by the Commission has been approved, the ERDF will be able to act more effectively in the removal of obstacles to the development of new economic activities by facilitating a broader distribution of new technologies through Community programmes or national programmes of interest to the Community as a whole. Drawing from the Regional Fund's past experience, especially as regards its non-quota activities, it could not only promote the dissemination of innovation in research and production but also support, for example:

- the creation or development of companies or other bodies providing guidance on management or organisation, through direct or indirect aids. These companies or bodies could temporarily help the undertakings to implement the advice given;
- the creation or development of services shared by several undertakings and which involve new technologies;
- promoting the dissemination of new technologies in industry and the service sector, in particular by:
 - o collecting information on new products and processes and disseminating it among undertakings, including the experimental application of such innovations;
 - o encouraging the use of innovatory products and processes.

28. In order to complement existing financial instruments, the Commission has also submitted a proposal, on which the Council should decide shortly, concerning Community financing for innovation - a "European Innovation Loan" (1).

(1) COM(83)241 final

Although modest in financial terms, by making the New Community Investment (NCI) available for the introduction of innovatory products or services developed by SMUs, the proposal could have an extensive multiplying effect. It could improve the general environment for innovation by promoting the development and, if necessary, the creation of structures specialising in the financing of innovation.

I. NEW TECHNOLOGIES AND EMPLOYMENT

1. The question of the impact of technological change on employment is by no means new, yet it remains at the heart of the debate on the social acceptability of new technologies. Two conclusions which emerge from the numerous studies which have been carried out need no further demonstration:
 - the relationships between employment and technological change are complex and cannot be isolated from the overall economic context;
 - the consequences of failure to adopt the new technologies would be far more serious in the medium and long term than those directly arising from their application.
2. In the light of these observations the purpose of this annex is to present some growing trends and forecasts concerning employment, in both user sectors and the sectors producing new technologies, as well as reflecting on the responses to be made to changes in the structure of the labour market brought about by technological innovation. It also presents some elements of reflection and analysis on the social implications of technological change other than employment: education and training, working and living conditions, participation in technological change.

I.1 The effect on employment levels

(a) The user sectors

3. The first observation which should perhaps be made is that the research carried out in this area leads to different conclusions depending on the level at which it is carried out - firm, sector, multi-sector - and on whether the new technology is incorporated primarily in products or in production processes.
4. At the level of the individual firm, those using new technologies in new products report in general a slight increase in employment due to increased demand for the new product. In cases where the technology relates to production processes, the impact on employment is more uncertain and appears to depend on whether increased sales of the product, through reduced costs or improved quality, are enough to compensate for the labour saving effects of the new process, or whether the jobs released are absorbed in new design, supervision and maintenance posts.
5. At the sectoral level it becomes more difficult to judge the direct and indirect effects of new technologies to the extent that the firms which do not adopt these technologies may lose their market share, without the resulting negative effects being necessarily compensated by a growth in employment in the more competitive firms.
6. Again, the prospects are more positive in sectors where new technologies can be incorporated into products: it has been estimated, for example, that the introduction of microprocessors into domestic appliances could lead to a net increase of 75 000 to 165 000 jobs by 1995 in the Community. This increase is high in relation to the present level of employment (100% to 500% depending on the product) but modest in absolute terms.

7. In the metalworking and mechanical engineering industry, on the other hand, where the main innovations have been in production processes - robots, numerically controlled machine tools, computer aided design, flexible manufacturing systems - forecasts indicate a possible direct loss of 160 000 to 400 000 jobs due to the introduction of robots and automated machinery.¹ The same tendency can be found in an increasing number of other industrial sectors where more and more operations are being automated (chemicals, textiles and clothing, pharmaceuticals, etc). The same could apply too in the service sector and office work, where the introduction of new information technologies can lead to considerable productivity increases.
8. Although the direct effects in these sectors could be negative, the overall impact on employment levels will depend on a number of factors: the way in which the technology is applied, the level of demand and the competitive position of the companies involved on national and international markets. The efforts of some companies, in response to the recession, to operate viably at lower rates of capacity use - in many cases through application of new technologies - may mean that they can respond to an upturn in demand with relatively low increases in either fixed capital investment or manpower.

(b) The sectors producing new technologies

9. In the industries which are directly related to the new technologies, the pace of change is so rapid and the competition so intense that long term and even medium term employment is not guaranteed in any area, despite generally strong demand and growth prospects. For example in the very competitive components and microprocessor sectors job losses have been recorded following the closure of a number of firms which had fallen behind in research and development. At the same time other firms of this type spring up, stimulating local development and wealth creation in general, although the impact on employment levels remains uncertain.
10. Similarly there are considerable prospects in microcomputers and personal computers. It has been forecasted that 50 000 jobs could be created in this sector within the Community.

¹Bulletin No 10 of EPOS (European Pool of Studies) 'Social change and technology in Europe', December 1982

11. As far as the development of software is concerned, the employment prospects are more encouraging in that this is a sector characterised in the main by small and medium size firms capable of seizing opportunities and responding to user needs, in industrial as well as cultural and educational markets. It is estimated that 900 000 workers were designing or producing software in the EEC, Spain and Portugal in 1981 and that the approximate growth rate in this area is 10% per year. Studies carried out in connection with the FAST programme indicate that 1 700 000 to 2 100 000 people will be employed in the software industry in Europe in the early 1990s, if various assumptions regarding the competitive position of European companies are confirmed.
12. The estimates given so far relate to existing products and services. The greatest scope for employment creation could lie in the development of new products and services linked to the new technologies. In the field of information technology and telecommunications, the development of direct broadcasting by satellite and cable television will create new opportunities for employment in the audio-visual sector, while advanced cable systems will in addition open up considerable possibilities in terms of interactive services. Products derived from biomass and new materials could equally be an important source of new job creation; however, the total potential in all these areas is far from being clear. According to estimates in the summary report on the FAST programme, it could be in the order of four to five million jobs by 1995.

I.2 The effect on the structure and operation of the labour market

13. Apart from quantitative repercussions on employment, another profoundly important effect of new technology is the qualitative transformation of the nature and structure of employment. The new information technologies in particular are tending to reinforce the trend towards a decline in manufacturing employment and a relative growth in service occupations - including those within the manufacturing sector. They are also a factor influencing the choice of larger firms to decentralise or subcontract some operations - a choice which favours the development of small businesses, even if the employment thus created may in some cases be precarious.
14. Furthermore, the geographic spread of new technologies has often helped increase regional disparities: new technologies are not tied to local sources of raw materials or factors of production in the same way that industries such as steel or textiles were and the regions where employment needs the most stimulation, whether 'old' industrial or rural areas, are also those which attract the least investment in job-creating technology.

The Community has already referred to the need for forward-looking labour market policies¹ which bring together the public employment services and two sides of industry at the local level. The effects of the dissemination of new technology have been optimised in those areas where this type of preventive and forward-looking approach has made it possible to:

- obtain early data on qualitative and quantitative trends at the level of the undertaking and local employment areas;
- introduce preventive measures (new work organisation, reconversion) and corrective action (intervention by public authorities: employment and enterprise creation incentives, etc.);
- encourage the development of local initiatives² facilitated by the positive attitude of regional and local authorities and the existence of development agencies and staff.

15. These general and sectoral tendencies result in practice in changes in the volume and structure of employment at the level of individual businesses and employment areas. It is at this level in particular that it is important to ensure that the labour market adapts to the new needs created by new technologies.

16. The forward-looking approach, aimed at integrating the employment dimension into local development strategies, has a two-fold function:

- 1) to identify relations between the local environment and the undertaking, and between the undertakings themselves;
- 2) to determine the human resources, labour market movements and the corresponding training requirements, with a view to such development.

17. A forward-looking approach to employment of this nature means, at undertaking level, that the labour force factor (volume of employment and skill structure) must be considered, along with the financial and technical factors, as a determining factor in the overall strategy of the enterprise, and not just as a result. In addition, the effective implementation of such an approach calls for the active participation not only of the public placement services, but also of the undertakings, trade unions, regional and local authorities and other local bodies involved in economic and social development.

1.3 The groups most affected

18. Over the next 10 to 15 years, the introduction of new technologies will considerably alter the characteristics of the labour market without it being possible to predict now all the changes which will occur - the risks of unemployment being nevertheless greater for the more disadvantaged groups: young people and women, especially those with few qualifications, migrant workers and older workers.

¹COM(80)186 Guidelines for a Community manpower policy

²COM(83)662 final. The contribution of local employment initiatives

19. National and Community policies already exist for these different categories of workers; rather than introducing new measures to cope with the spread of new technologies, the existing policies should be strengthened. It should however be noted that the situation of women workers is particularly unsatisfactory, in spite of the fact that it was initially thought that new technologies were having a relatively favourable impact on women's employment - if only through the development of the electronics industry which employs a high proportion of women, albeit only semi-skilled. Women in the services sector whose tasks generally consist in handling data suffer from the gradual diminution of routine office work and the introduction of more efficient machines usually requiring new skills.

Similarly in the industrial sector female employment is concentrated in low skill, routine jobs, ie the areas most easily automated. The weak position of women also stems from the fact that, further upstream, the percentage of girls in technological and scientific education is very small. This is detrimental to their occupational integration and their future, in a world where technological skills and knowhow are a major advantage.

20. As regards older workers, the first step is to provide them with the necessary training enabling them to cope with the technological changes in the undertaking or to train for work in a different sector of activity. Where such retraining is too difficult, measures should be envisaged to encourage the use of their skills and work experience in other positions (supervision of on-job training of young persons in the undertaking, gradual retirement enabling them to make the transition to other interests).

I.4 New technologies and working time

21. The principles on the reduction and reorganisation of working time formulated in the Commission's draft Recommendation² are particularly relevant in the context of the introduction of new technologies, in view of the potential impact of the latter not only on the level of employment but also on the organisation of work within the individual company. The introduction of new technology systems or processes in itself requires a re-examination and most often a reorganisation of work, with the possibility of increased flexibility. The reorganisation of work schedules offers an opportunity to reduce individual working time which, provided firms' competitiveness is not affected, can help to save or create jobs.
22. Similarly, the introduction of new technologies can offer increased opportunities for part-time work. In this respect it should be noted that the development of part-time work also requires an improvement in the status of the workers concerned, which again underlines the need for adoption by the Council of the draft Directive on this subject.

¹ COM(83)853 final: Women's unemployment

² COM(83)543

23. The reorganisation and reduction of working time can indeed facilitate the introduction of new technologies and help the enterprise concerned to achieve the optimum return on its investment, by permitting the more continuous use of equipment or reducing waiting time.

II. TRAINING, QUALIFICATIONS, EDUCATION AND THE NEW TECHNOLOGIES

II.1 Training in the user industries

24. The first observation to be made is that the relationship between job content (present and future) and training is both indirect and complex. We are not just talking about minor technical changes, but about new expertise requiring new qualifications and skills. The social change brought about by technological progress calls for a fundamental rethinking of the place and nature of both initial and continuous training, and, above all, efforts to ensure that action taken in this field is not seen as a rearguard action. A vigorous and sustained effort is all the more essential in view of the slowness with which training and educational systems tend to respond, while the speed of technological change calls for a continuous process of supplementary training or retraining.
25. The second basic point to bear in mind is that, just as technology itself does not dictate employment levels, vocational qualifications and the associated training needs are not directly and exclusively determined by technological innovation. There is still some margin of choice: decisions as to what aspects of technology to take into account vary according to the behaviour of the social groups involved, as well as depending on employment and labour policies and the socio-economic environment within which the decision is taken. All it takes is for one of these factors to change, and the qualifications required become radically different.
26. It is in this context that certain trends emerging in the industrial and service sectors should be considered. The precise nature of man's role in the production process has undergone far-reaching and subtle changes, which vary according to the degree of automation on the one hand, and the position of that automation in the process on the other, not to mention the type of goods or services produced:
- 1) In continuous process industries where the quantity produced over a given period of time does not depend on the way the work is organised and where the main thing is to ensure that the various physical and chemical operations involved proceed normally, new types of work and the need for new qualifications are emerging specifically in connection with the control and maintenance activities. Those responsible for these activities have to be relatively versatile, ie in the event of malfunction, they must be able to intervene at different stages of the production process. Above all, given the virtually total automation of these continuous production processes, workers must be able to interpret signals given all along the line.

- 2) In production line industries where productivity cannot be dissociated from the rhythm of work the impact of new technologies varies according to the nature of the work; automation of assembly and, above all, machining, can lead to the loss of a significant number of semi-skilled and skilled manufacturing jobs, but also to the creation of supervision, quality control, programming and maintenance jobs. In the changing relationships between jobs and qualifications, certain skills are being downgraded (the checker becomes a machine-minder) while others are being upgraded (the checker takes on more complex maintenance, diagnostic and repair duties).
- 3) In the service sector (banks, insurance, commerce, public administration, etc. including administrative departments within manufacturing firms coming within sectors 1 and 2, there is not a trend towards concentration/polarisation of tasks, involving radical changes in the relationship between work and qualifications. As the activities of certain departments are standardized an impoverishment of individual tasks sets in, which in turn leads to the downgrading of the qualifications required; at the same time there is a concentration of expertise in analysis, programming marketing and management departments. This process of polarisation and occupational downgrading is also taking place in the very jobs which have themselves emerged in the train of the new technologies.
27. Any analysis of the effects of technological change on qualifications should look beyond the changes affecting the skills of the individual worker: there are other factors which are radically changing the organisation of work, including the growing importance of service-sector type activities in the production process, and the increasing use of sub-contracting and shift work in many areas, all of which affect workers' opportunities for occupational and social integration.
28. The first implication of these changes is that qualifications related to technological change may need to bring out social qualities and behaviour as well as specific skills related to the ability to adapt to the new forms of work organisation: that is why these new qualifications and the training required to obtain them should be a fundamental element of the social dialogue.
29. The term "new qualifications" should, however, be treated with caution: the qualifications required by new technologies do not necessarily render all existing skills obsolete, quite the reverse. It makes more sense to teach a technician how to write programmes rather than to train a programmer to become a technician; likewise, new jobs linked to technological innovation draw on existing professional experience. This, in conjunction with the concept of social skills, is an argument in favour of maintaining qualifications, or at least of using existing ones in a different context, while resisting any trend towards polarisation.
30. A second implication is that more attention should be given to the training of people who are directly concerned by these new technologies in industry - managerial and supervisory staff in the first place, as well as workers' representatives.

Structural changes in undertakings brought about by new technology call for in-depth training of managerial staff, not only for the technical management of the new equipment but also to deal with the social implications of the new technologies. The same applies to the workforce where action should be taken at three complementary levels: provision of information to all workers, more advanced familiarisation courses for those in undertakings who are directly involved in the procedures referred to above, and training for trade union experts.

31. More generally, there is a need for the population as a whole to be made aware of the new technologies which, from informatics to telematics, will radically change the relationship between the individual and his environment (family, school, community). The fragmentation of work already mentioned also has major social implications. On the other hand, efforts to develop initiative and autonomy at local level for instance, may be a very good way of introducing people to the new technologies, all the more so since young people tend to be particularly interested in these developments.

II.2 High level training

32. A major aspect of the development of education and training in new technologies which remains to be discussed is the needs directly related to research and innovation in the new technologies themselves.
33. The information available to the Commission, although fragmented, indicates that there is a serious and persistent shortage of highly skilled personnel able to operate at the interface between pure research and industry on the development of new technology based products, services and production processes. There are few signs of this situation improving in the short term and indeed there is growing concern in industrial and research circles at the lack of measures being taken to ensure that the rapidly growing manpower needs of the leading edge industries, in terms of both research and applications activities, will be met in the medium and long term.
34. It is fair to suggest that the most determined efforts in the fields of research, development and industrial policy will be hampered - and might even fail - unless they are matched by similar efforts in initial and continuing training for high-level specialists and technicians, particularly in areas which have only recently been opened up, such as the interdisciplinary qualifications resulting from the convergences characteristic of the new technologies: convergences between telecommunications and computing, between electronics and mechanical engineering, between systems design and behavioural sciences, between biochemistry and agriculture.

¹ COM(83)662 - Local employment initiatives

35. Beyond the need for a significant quantitative expansion in the opportunities for initial and continuing training in key areas such as information technology, there is a need for new forms of higher education and training which bridge the gap that too often exists between universities, industry and research institutes, and which will ensure that research and development, industrial innovation and training go hand in hand. It is essential not only to improve training as such, but also to encourage mutually supporting action between industry and the universities.
36. The new Community initiatives in research and development and industrial policy - in particular ESPRIT - are not small scale, limited actions but the beginning of a major, long term effort for which the necessity of cooperation and the pooling of resources at Community level has been clearly demonstrated.
37. The provisions made for Community action on training in new technologies so far, while they will make a partial contribution, will not in themselves be adequate to ensure that the human resources necessary for the successful development of these initiatives will in fact be available. The scope for support from the European Social Fund is in this respect limited, since beneficiaries (apart from those under 25) must generally be job seekers or unemployed. It is not in any event the role of the Fund - which is essentially an instrument of labour market policy - to support the development of mutually supporting action between higher education establishments, industry and research institutes. Conversely, although limited provision may have been made in some Community research programmes - notably biomolecular engineering - for researchers to complement their expertise through exchanges in the framework of the programmes, it is not the role of Community research programmers to ensure the development of a response to manpower needs which would embrace initial training and the training of skilled applications technicians.

III. NEW TECHNOLOGIES, WORKING AND LIVING CONDITIONS

III.1 Working conditions

38. As in the fields of employment and training, the relationship between new technologies and working conditions is not a deterministic one, but depends on the choices made at several levels: research and development, product or system design, implementation.
39. New technologies can help to improve overall working conditions notably through the automation of tasks which are strenuous, hazardous or unpleasant or which are monotonous and repetitive. However, developments are taking place so rapidly that continued research, monitoring and action is necessary to generate a better understanding of the possible risks to health and safety which may arise, to introduce health and safety standards in relation to particular substances, techniques or items of equipment and to ensure that the full potential of new technologies to improve working conditions is realised.

40. It is useful in this respect to divide the questions posed in the field of health and safety and working conditions into three areas: new materials and techniques; biotechnologies; and microelectronics/information technology applications.

(a) New materials and techniques

Examples of these technologies, of which some applications will probably experience a considerable increase in annual growth rate, include the development of laser technology, electronic beam welding, particle technology and other non-ionising radiations. These techniques, and others such as the use of electromagnetic fields, of radio frequencies, and of micro-waves in industrial applications bring with them risks to health and safety but the available information on these risks is inadequate at present to determine the measures that need to be taken. Other techniques relating to adhesive bonding, to polymers, composites and other new materials and to materials used in catalysis require careful toxicological evaluation to ensure that the risks to health are reduced to a minimum. An example of specific research that is required relates to the use of zeolites as catalysts since recent work has demonstrated that certain zeolites possess a carcinogenic potential for man.

(b) Biotechnology

The rapid progress made in biotechnology in recent years has caused concern in some quarters at the prospect of new products and processes being manufactured and used without adequate safety measures or control. This concern has arisen from the fear that alterations to genetic structures might have seriously damaging results with the result that there have been codes of practice introduced to scrutinise experiments in the field of genetic manipulation. From the results of the assessments carried out to date it appears that the dangers were over-estimated. However, there is still a need for clear-cut safety measures when handling micro-organisms dangerous to man. As with all plants and processes only a thorough knowledge of the nature of the work and good training can prevent hazards on the one hand and over caution on the other. From the Commission's point of view, there is a need to follow closely developments in this field, notably through the work being carried out by the OECD and the Council of Europe, with a view to introducing appropriate measures as and when these are required.

(c) Microelectronics and information technology

The areas of concern for physical health and safety in relation to these technologies are relatively limited. Further work on the specific problems associated with visual display units needs to be

carried out to determine what health and safety measures are required in the future, while there is also an increasing volume of evidence accumulating on the accidents arising from automation and robotics which point to the need for health and safety aspects to be included at an early stage in product design. These problems should be seen, however, in the wider context of man/machine interface and ergonomic design, where psychological considerations are as important, or more so, than purely physical ones. In order to solve problems relating to the safety of automated equipment at the design stage, it may be necessary to consult not only the end users but also the ergonomists and machine designers who are able to make the connection between, on the one hand technical performance, and on the other, workers' skills and limitations. Similar considerations apply to the design and use of information technology systems, where problems of stress can occur due to the effort of concentration required of users or to the constraints of working with computer languages and software systems which are not user friendly.

These considerations also need to be borne in mind when looking at the broader aspects of working conditions and job quality. In the longer run, it is at the level of research and development - from the closer adaptation of computer languages to human creative thought processes to the assumptions about working methods and human communications on which the office systems of the future will be based - that the most important work allowing new information technologies to contribute to an improvement in working conditions may be done.

More immediately, the larger information technology systems now being introduced often require a significant design effort in order to 'customise' both their physical distribution (hardware) and the facilities offered (software). In such cases, the implications for the quality of individual jobs can and should be taken into account at the initial design stage.

Finally, at the level of implementation, the existence of margins of choice in the way in which automated equipment and processes are put into operation should be recognised, in particular as regards the scope for avoiding a polarisation of skills or a compartmentalisation of tasks which could render certain jobs more rather than less stressful or monotonous. Case studies presented in the context of the FAST programme indicate that the introduction of new technologies has been achieved more successfully when the available choices have been exercised in the direction of increased responsibility being given to individual workers or groups of workers, the exploitation of existing skills and greater flexibility in working patterns.

41. In addition to the need to pursue the development of health and safety standards within the existing Community programme of action, the summary analysis given above leads to the following considerations:
- (a) the need to give sufficient emphasis to ergonomic and human interface aspects within research programmes relevant to office or manufacturing technology (eg, at Community level the corresponding sections of the ESPRIT programme);
 - (b) the need to train specialists competent in both ergonomics and the technical aspects of particular (sectoral) application areas;
 - (c) the need to feature working conditions and new technologies in management training programmes, including familiarisation with system design methods which involve the potential users of the system in the design process;
 - (d) the need to gather and exchange at Community level examples of good practice and successful experiences concerning the use of new technologies to improve working conditions within particular sectors.
42. One should also note the need to monitor the phenomenon of distance working, ie the decentralisation of a greater or lesser part of the activity of a company or organisation to small local units or to home based workers, using new communications and office technologies to link these 'outposts' to the management centre and possibly to each other. This is a development which could clearly have a direct impact on living conditions, for the better - in terms of reduced commuting, the retention or creation of employment opportunities in certain areas, contact with the family and more flexible working hours - or possibly for the worse, in terms of loss of social contact (particularly in the case of home working), insufficient means of safeguarding workers' interests and the fragmentation of management/employee relations in general. Further studies and research need to be undertaken to clarify societal options far enough in advance; to pool information on the effects on employment creation, working conditions and health and safety, the possible impact on wage, tax and social security systems and implications for trade union structures and industrial relations; and to analyse the consequences with governments and the social partners.

III.2 Living conditions

43. It is beyond the scope of this document to discuss fully the possible impact of new technologies on living conditions. The purpose of this section is to highlight certain developments which could take on a greater significance in the medium term and which are closely related to working conditions or to the scope for new economic activity and employment creation based on new technologies.

44. It should be stressed that the structure of our lifetime is constantly evolving: in 1900, for a man with a life expectancy of 50 years, working time represented more than 25% of his lifetime. Today, with a life expectancy of 72 years, it represents only 10% of a man's lifetime, while "free time" represents more than 25%.
45. This shows the importance which should be given to the leisure and tourism industries and to their growth potential. In addition to the contribution which new technologies could make to the increase in free time as such, they could foster the development of new goods and services in this area: for example dedicated information networks for clubs of all kinds, local information services and distance learning.
46. A further area of potential which would directly combine the objectives of social and industrial strategies for new technologies is the expansion of "leading edge" industries - telecommunications, information technology, biotechnology, alternative energy sources, new materials - for the production of new goods and services which also focus on human needs and problems: health, leisure activities, continuous training and adult education, elderly people, loneliness, etc. These are all fields capable of becoming major sources of employment in the medium term, and which should benefit from the support of Community funds and lending instruments.
47. One such area which can already be singled out is the contribution of these new technologies to the process of integrating handicapped persons into society. Whether it is a matter of microelectrodes implanted near "preserved" nerve cells in tetraplegics which determine the electrical current that will convey the message for the next step or a videocom allowing patients with cerebral motor deficiencies to communicate with those around them, the new technologies are beginning to offer numerous possibilities for the handicapped - an approach which is already being promoted in the Council resolutions on their integration into society (1) and on the introduction of the new information technologies in education (2). Having regard to the size of the market, in addition to the social importance, and the fact that most developments in this field stem from small - and medium - sized undertakings which do not have the necessary resources at their disposal, the handicapped could be considered as a priority field for the application of the new information technologies at the intersection of industrial and social policies, particularly education and training.

¹ OJ C 347, 31.12.1981

² OJ C 256, 24.9.1983

IV. THE INTRODUCTION OF THE NEW TECHNOLOGIES IN FIRMS: INFORMING AND CONSULTING THE WORKERS

48. It has been emphasised on several occasions that the new technologies and, more generally, technological change, make it both essential and urgent to involve workers in decisions concerning them - if only on account of the uncertainties created regarding the scope and extent of the changes wrought, particularly as regards employment - without however calling into question management's power of decision.
49. Acceptance of technological change in socially satisfactory circumstances and control of the consequent social changes highlight the need to seek a consensus among all economic and social forces concerned. Moreover, the lack or inadequacy of procedures for informing and consulting workers on technological change cannot fail to engender attitudes of resistance - or even outright rejection - thereby acting as a break on firms' innovative capacities.
50. In several Member States, unions and management have negotiated "technological agreements" at company, sectoral or national level. Under such agreements, specific mechanisms and procedures for informing and consulting workers have been introduced and include provisions for their protection in the areas of employment, vocational training and re-training, working conditions, health and safety, etc. In addition, legislative amendments, modifying powers and prerogatives with regard to informing and consulting workers' representative bodies in firms have been introduced in some Member States, taking the form in some cases of the granting to employees of the right to express their opinions, directly and collectively, on working conditions and the organisation of work.
51. In concluding its proceedings, the Standing Committee on Employment, meeting in November 1981, recognised the need to involve workers and their representatives in the introduction of the new technologies in firms. The Commission was then asked to pursue its comparative study of existing provisions in this area, with the possibility of a "joint declaration" by both sides of industry being advanced as a suggestion for subsequent action.
52. Along these lines, the Commission has striven to encourage a dialogue between the social partners by organising round tables at inter-sectoral level in each of the Member States during 1982. These meetings, which brought together government experts, employers, trade unions and other parties made it possible both to obtain further information on legislative provisions and practices in the Member States concerning

the involvement of workers in decisions regarding technology in firms and also to identify the difficulties involved in adopting a common approach at Community level.

53. In the second stage, and on the basis of these informal meetings, the Commission organised exchanges of views with the European Trade Union Confederation and also with the Employers' Liaison Committee and the European Centre for Public Enterprises at two seminars (held in May and July 1983), the primary purpose of which was to take stock of current developments and clarify the arguments being put forward in various quarters.
54. These various meetings (round tables and seminars) have revealed opposition by employers' organisations and support from workers' organisations for a Community approach which takes account of the entire range of problems facing workers by virtue of technological changes and affecting every aspect of the employment relationship (employment, training, working conditions, work organisation, health and safety at work, etc.).
55. That the question of employee involvement in technological choices should be at the centre of these discussions confirms the importance of the problem and the nature of the issues at stake. Just as uncertainties about employment, when they are not attended in the short term at least, by redundancies, justify in the eyes of workers and their representatives their participation in firms' decisions concerning technological innovation, so do employers consider themselves founded, confronted with the demands of competition, in keeping their responsibility for the choice of investment, especially since there is always a potential risk of premature disclosure which could damage the company's interests.
56. Although experience has shown that dialogue on this point between the social partners is difficult, the Commission nevertheless considers it essential that this dialogue should be pursued whatever the opening positions, so as ultimately to formulate principles aimed at ensuring, with due consideration being given to existing machinery, the information and consultation of workers concerning the consequences of the introduction of new technologies in firms. This would involve fostering the emergence of a dialogue which is all the more urgent and essential as the spread of the new technologies continues apace in the production system and in communication systems within companies.
57. It is desirable that workers should be informed and consulted throughout the process of technological change, identifying the possible implications for workers and taking into account the need to safeguard firms' interests (including the protection of confidential information) and without calling into question decision-making responsibilities within the firm. This dialogue should cover such points as redundancies and changes to work posts, the necessary training and retraining measures and working conditions and work organisation, all these being considered in the context of the firm's economic perspectives.

58. It would appear that the firm, with its specific characteristics, will have to become the principal forum for the involvement of workers in the introduction of new technologies. For this involvement to be effective, it must take place as close as possible to the place of work, thereby enabling the various parties concerned to tackle social changes from a practical standpoint.
59. The social partners should pay particular attention to the training of trade union experts in the field of technological innovation and, more generally, to alerting the workers themselves to this question. A development in this direction would enable workers to make better use of the opportunities offered by existing provisions as regards consultation and information, to understand better the implications and effects of technological change and so to accept them in full awareness of these factors. In some cases the assistance of experts from outside the firm may be necessary or useful, bearing in mind however that their presence could possibly increase the problems concerning confidential information referred to above.